

WELCOME to the

CECA
UoFT



SOLAR WORKSHOP

What is CECA?

Multi-disciplinary design team

- Provide **workshops** on sustainable building energy
- Participate in **Green Energy Challenge** (design competition)
 - Proposal for building in community to reduce energy usage and move towards net-zero
- Provide **networking opportunities** with industry professionals
- Provide opportunity to use **softwares** to help audit and evaluate building performance



OUTLINE



- 1. Sub-components**
- 2. Connection details**
- 3. Shading analysis**
- 4. Activity : Sizing a solar energy system**

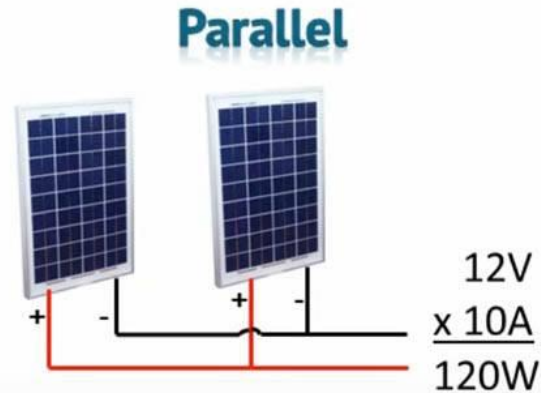
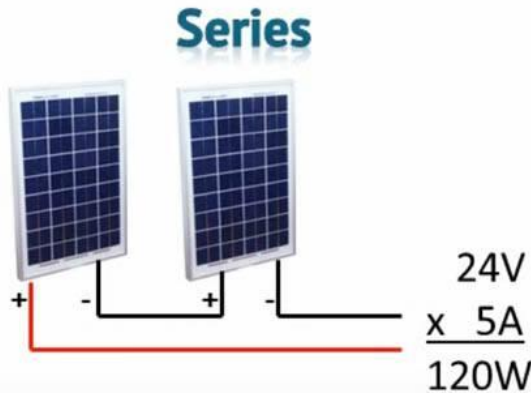
Why solar retrofit?

- Contributor to achieving net zero energy for a building
- Clean and renewable on-site energy production



Basic Concepts

- Series connection: connect negative charge to positive charge
 - Current stays the same, voltage increase
- Parallel connection: connect positive to positive and vice versa
 - Current increase, voltage stays the same



Two 60 Watt, 12 Volt, 5 Amp panels

What components can you find?

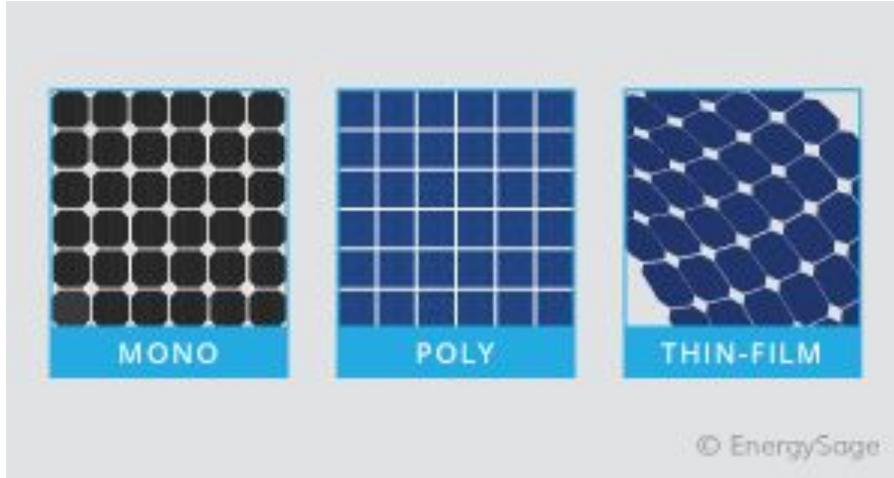


What components can you find?



Components that make up a solar energy system

Panels



<https://www.energysage.com/solar/101/types-solar-panels/>

- Generates electricity when exposed to sunlight
- Monocrystalline panel
 - Most efficient but costly
- Polycrystalline panel
 - Low cost but less efficient
- Thin-film panel
 - Flexible and lightweight
 - Very low efficiency

Components that make up a solar energy system

Racking



<https://www.wholesalesolar.com/blog/best-solar-panel-mounts>

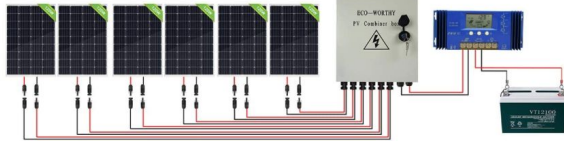
- Fixed mount
 - Drilled racking onto roof
 - Least expensive
- Ballasted mount
 - No need to drill holes into the roof, use free-standing base
 - Work for flat or low-sloped roof
- Pole mount
 - Ground clearance, steep angle
 - Shading issue from surrounding structure

Components that make up a solar energy system

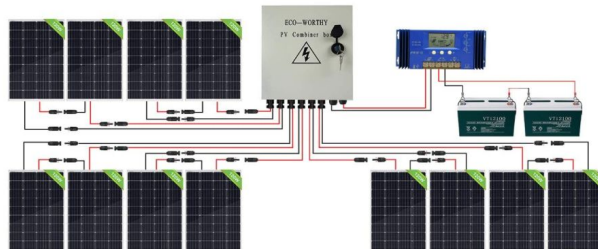
Combiner box



Supports up to **1080W** solar panel kit (12V)



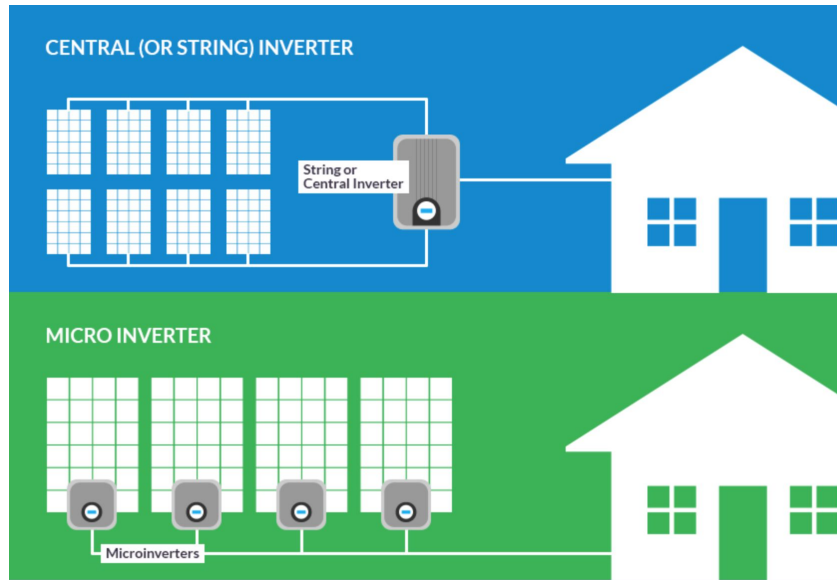
Supports up to **2160W** solar panel kit (24V)



- Bring output of solar arrays together to flow in series
 - Ensure constant current and voltage into the inverter
- Capacity of a combiner box can be determined by the voltage of the solar arrays

Components that make up a solar energy system

Inverter

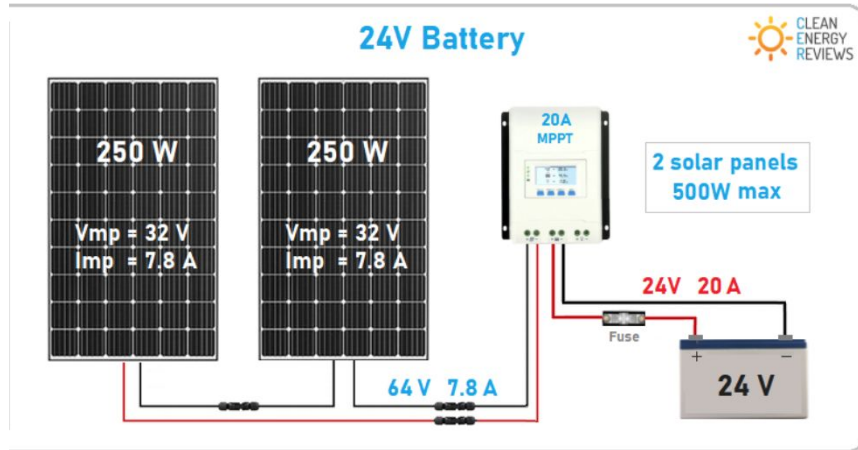


<https://solartribune.com/your-home/inverters/>

- Inverters regulates the voltage solar panel receives
 - Changes from Direct Current (DC) to Alternating Current (AC)
- Central inverter vs. Micro-inverter

Components that make up a solar energy system

Charge controller & Battery

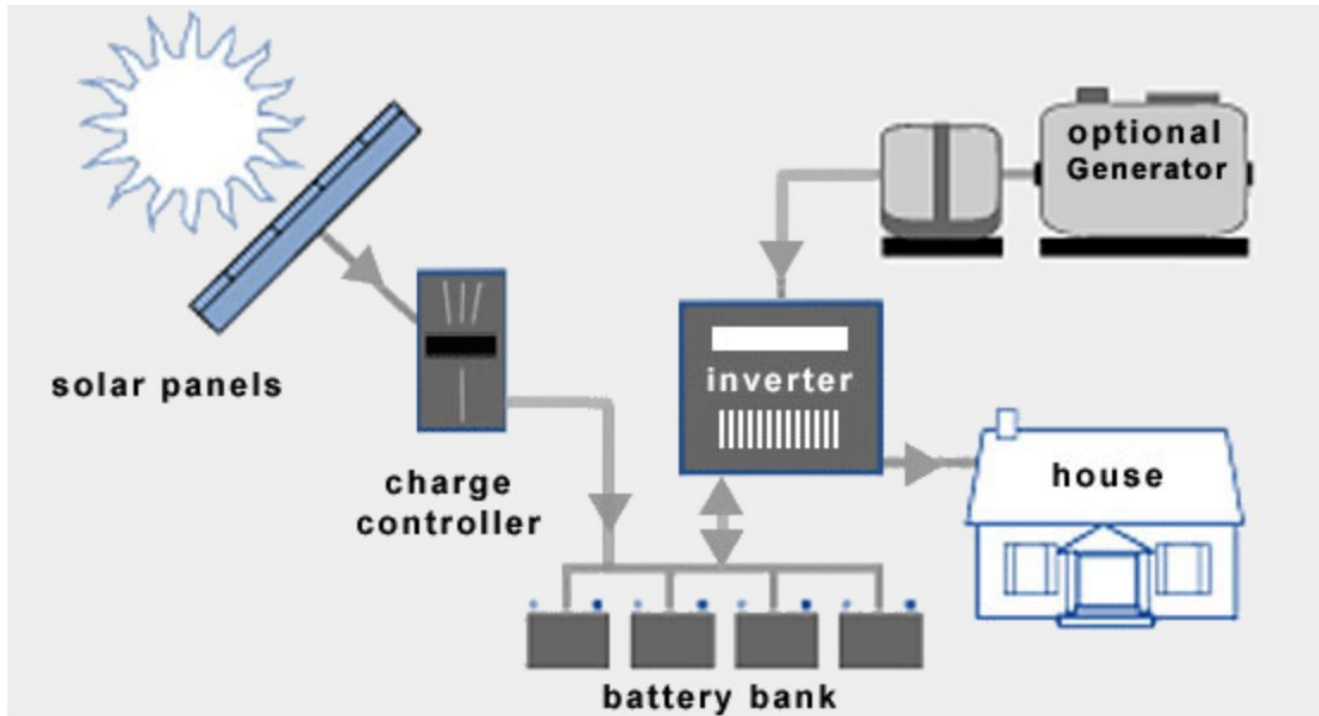


<https://www.cleanenergyreviews.info/blog/mppt-solar-charge-controllers>

- Charge controller is used to protect the battery storage
 - Overcharged or undercharged batteries can lose life
- Battery should be designed above the capacity required

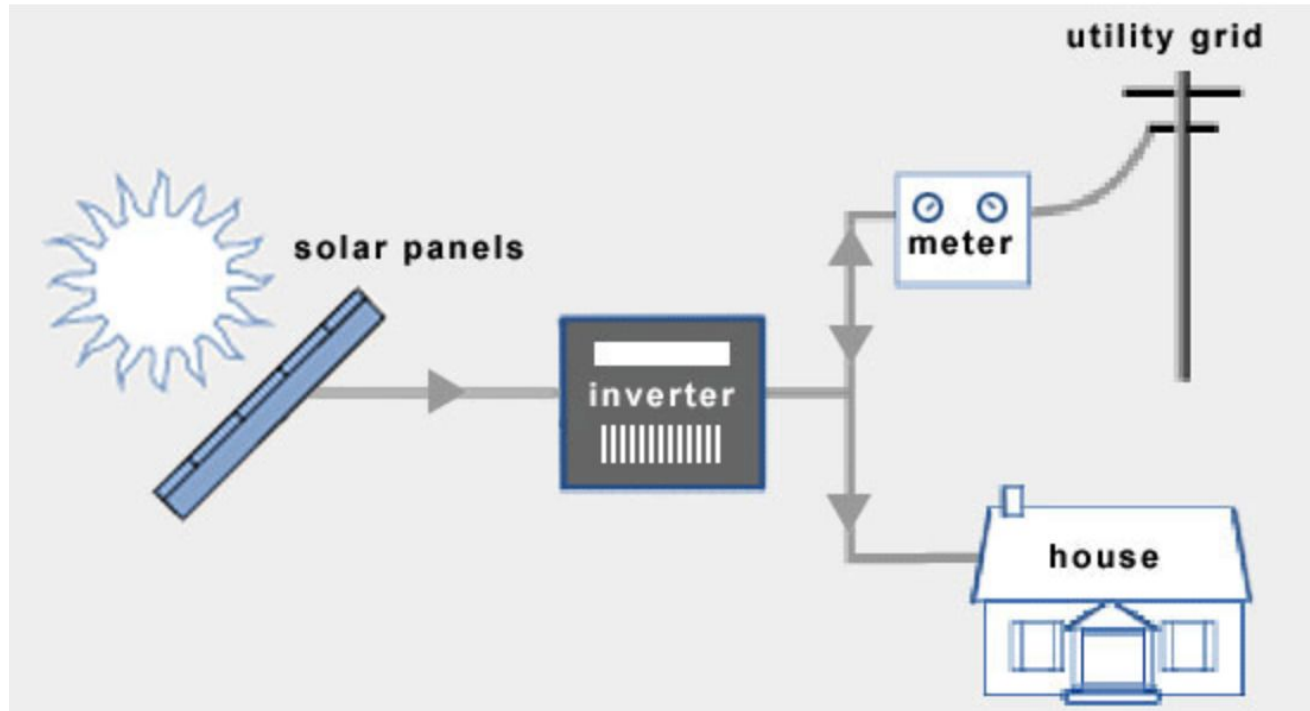
Types of connection system

Off-grid



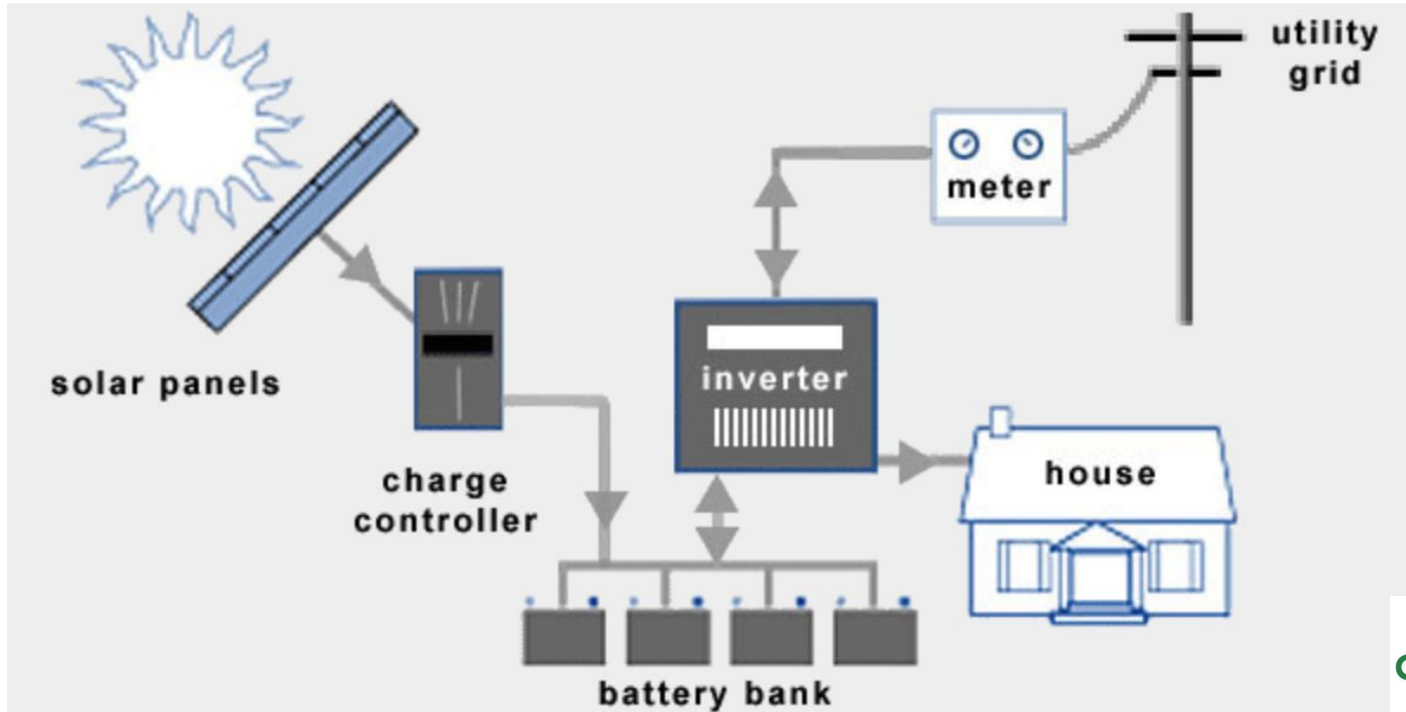
Types of connection system

Grid-tied

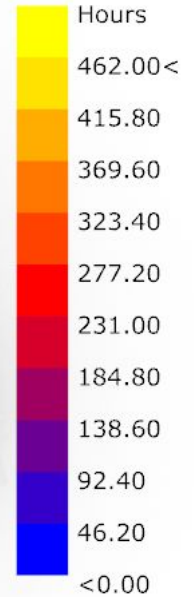
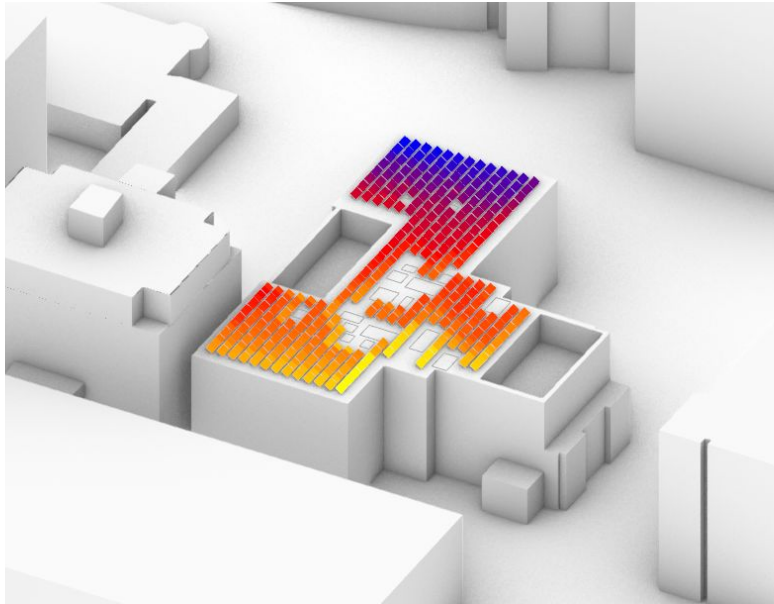


Types of connection system

Hybrid



Shading analysis



Activity: design a PV system for your home

- Determine your annual electricity usage at home
 - Can check utility bills for this information
 - Or use the average household consumption in Canada: **~11,000 kWh**
- Pick a type of solar panel (from handout)
- Find out how many panels you need to produce the same amount as the usage
 - Refer to the handout for solar production at different locations

Extra: check out how much money can be saved with your pv system / Estimate the total area required

Activity: determine size of PV system for your home

- Calculate the total amount of energy your design can produce annually
 - Refer to the handout for solar production at different locations
- Extra: check out how much money can be saved with your pv system

Questions?



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THANK YOU

for Coming to our Kickoff!

Remember to...

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Contact us at new email: cecAUoft@skule.ca

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